

Bull. Natn. Sci. Mus., Tokyo, Ser. A, 16(3), pp. 97–103, September 22, 1990

Pseudaliid Nematodes from Dall's Porpoise,  
*Phocoenoides dalli*

By

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**Abstract** Three species of pseudaliid nematodes were collected from the cranial sinuses of the Dall's porpoise, *Phocoenoides dalli*, caught in and around the northern North Pacific: 1) *Stenurus truei* was originally described based on the male alone. The female is described here for the first time; 2) *S. yamagutii* sp. n. is characteristic in having bifurcated ventral ray, no inner projection on the lateral ray, and two large bosses just before and behind the vulva; and 3) The original description of the female of *Pharurus dalli* erroneously included a different species, *S. yamagutii*. The amended description and the taxonomic comment are given.

The Dall's porpoise, *Phocoenoides dalli* (TRUE, 1885), is distributed in the northern North Pacific, the Sea of Japan, the Sea of Okhotsk and the Bering Sea (NISHIWAKI, 1967; KASUYA, 1978). Two species of pseudaliid nematodes, *Stenurus minor* (KUHN, 1829) and *Pharurus dalli* (YAMAGUTI, 1951), were previously known from the cranial sinuses or nasal cavities of Dall's porpoise (DAILEY, 1971; DAILEY & WALKER, 1978; YAMAGUTI, 1951). One more pseudaliid nematode, *Stenurus truei* MACHIDA, 1974, was reported in the tympanic cavities forming parts of the cranial sinuses, of the *truei*-type of Dall's porpoise which inhabits a limited area off the Pacific coast of northern Japan (MACHIDA, 1974).

The present report deals with three species of pseudaliid nematodes including a new one from Dall's porpoise. The porpoises were caught by scientific research vessels, commercial fishery boats or incidentally caught in gill-nets for salmon or squid during 1987 and 1988. A total of 50 frozen or cold-storage heads of the porpoises were examined, of which 7 were from the Bering Sea, 20 from the northern North Pacific, and 23 from the adjoining seas of northern Japan.

Nematodes were preserved in 5% formalin and cleared in Gater's solution.

Specimens are deposited in the collection of the National Science Museum, Tokyo (NSMT).

Our special thanks are due to Prof. K. SHIMAZAKI, Faculty of Fisheries, Hokkaido University, and Dr. N. MIYAZAKI, Department of Zoology, National Science Museum, Tokyo, for giving us opportunities to examine the parasites of Dall's porpoise.

#### Family Pseudaliidae

##### *Stenurus truei* MACHIDA, 1974

(Figs. 1-6)

*Host.* *Phocoenoides dalli* (Prevalence 49 of 50).

*Site.* Cranial sinuses.

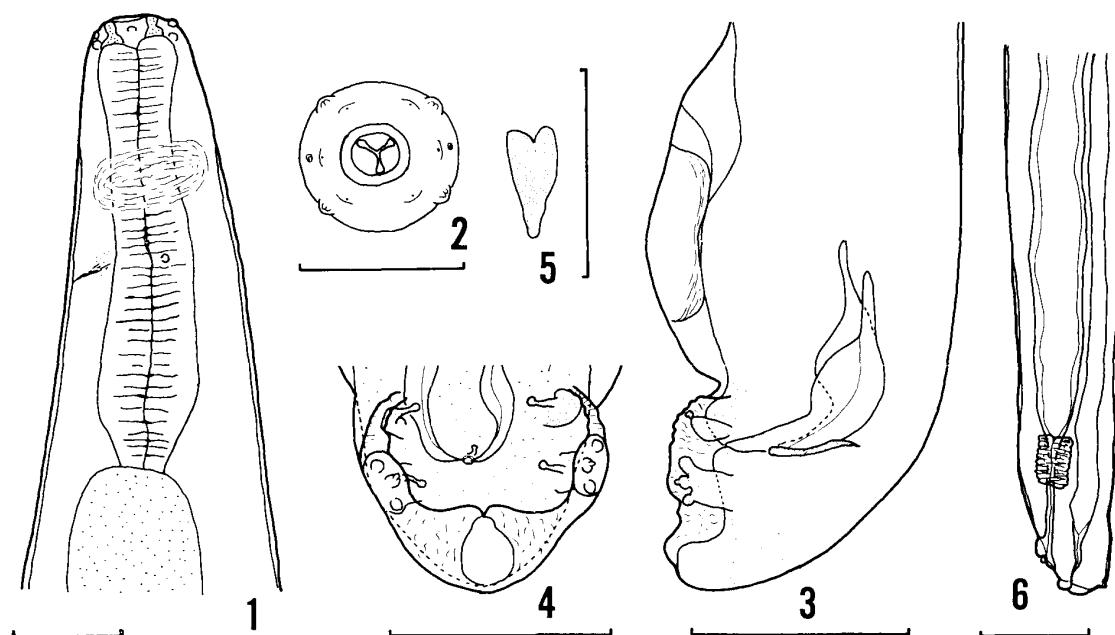
*Locality.* The northern North Pacific, Bering Sea and adjoining seas of northern Japan.

*Specimen No.* NSMT-As 1637.

*Description.* General: Body slender, blackish or dark brown in color in life, with maximum width in anterior portion, tapering gradually toward posterior end. Mouth surrounded by inner circle consisting of six small papillae and outer circle composed of two lateral amphids and four large submedian papillae. Each submedian papilla made up of double processes of pulp under cuticular inflation, and situated at posterior level of buccal capsule. Buccal capsule with thick chitinous wall. Esophagus musculoglandular, with triradiate lumen.

Male: Based on 20 specimens. Body 7.9-9.8 mm in length and 0.29-0.39 mm in maximum width. Buccal capsule 26-33  $\mu\text{m}$  in inside diameter and 20-27  $\mu\text{m}$  in depth. Esophagus 0.34-0.44 mm long. Nerve ring, cervical papillae and excretory pore 0.14-0.17 mm, 0.23-0.31 mm and 0.27-0.32 mm from head end, respectively. A sucker-like depression 85-120  $\mu\text{m}$  in diameter, lying in front of bursa. Bursa cuticular, not divided into lobes, 57-80  $\mu\text{m}$  in diameter, with margin curved inwards. Ventral ray ending in an inward-directed, tapering projection. Lateral ray terminating in three digitations, of them the central one has a papilliform tip. A short, inward-directed projection situated near the base of lateral ray. Dorsal ray with simple termination. Spicules curved, similar, equal, 0.10-0.15 mm long, divided into three portions; the proximal is slender, the middle is broad 18-35  $\mu\text{m}$  wide, and the distal terminates in blunt tip. Gubernaculum thin, elongate heart-shaped in ventral view, 33-49  $\mu\text{m}$  long. A single median papilla lying just anterior to anus. Tail 35-65  $\mu\text{m}$  long.

Female: Based on 20 specimens. Body slender, 8.9-11.6 mm in length and 0.34-0.43 mm in maximum width. Buccal capsule 29-35  $\mu\text{m}$  in inside diameter and 19-27  $\mu\text{m}$  in depth. Esophagus 0.35-0.47 mm long. Nerve ring, cervical papillae and excretory pore 0.15-0.18 mm, 0.25-0.31 mm and 0.29-0.32 mm from head end, respectively. Uteri parallel to each other. Fully mature eggs 65-78  $\times$  42-52



Figs. 1-6. *Stenurus truei* MACHIDA, 1974.—1. Anterior end, lateral view. 2. Head, apical view. 3. Posterior end of male, lateral view. 4. Bursa, ventral view. 5. Gubernaculum, ventral view. 6. Posterior end of female, lateral view. (Scales: 0.1 mm.)

$\mu\text{m}$ . Uterine larvae  $260-290 \times 12-13 \mu\text{m}$ . Uterine trunk and vagina  $0.30-0.47 \text{ mm}$  long and  $0.12-0.18 \text{ mm}$  long, respectively. Vaginal sphincter  $50-80 \times 30-45 \mu\text{m}$ , covered nearly proximal half of vagina. Vulva situated  $29-45 \mu\text{m}$  in front of anus, provided with two small cuticular bosses just before and behind the vulva. Tail truncated,  $10-30 \mu\text{m}$  long, with a pair of small papillae near the tip.

*Discussion.* MACHIDA (1974) obtained two species of pseudaliids, *Stenurus truei* and *Pharurus dalli*, from the tympanic cavities of the *truei*-type of Dall's porpoise, but he did not make a distinction of the females between the two. The present study revealed that the female of *S. truei* can be separated from that of *P. dalli* by having a truncated tail and a short vagina. The female of *S. truei* resembles that of *S. minor* in having a truncated tail, but differs from it in that the latter is nearly twice as long as *S. truei* and has a sphincter covering almost the full length of the vagina. The male of the present material agrees well with the original description of *S. truei*.

#### *Stenurus yamagutii* sp. n.

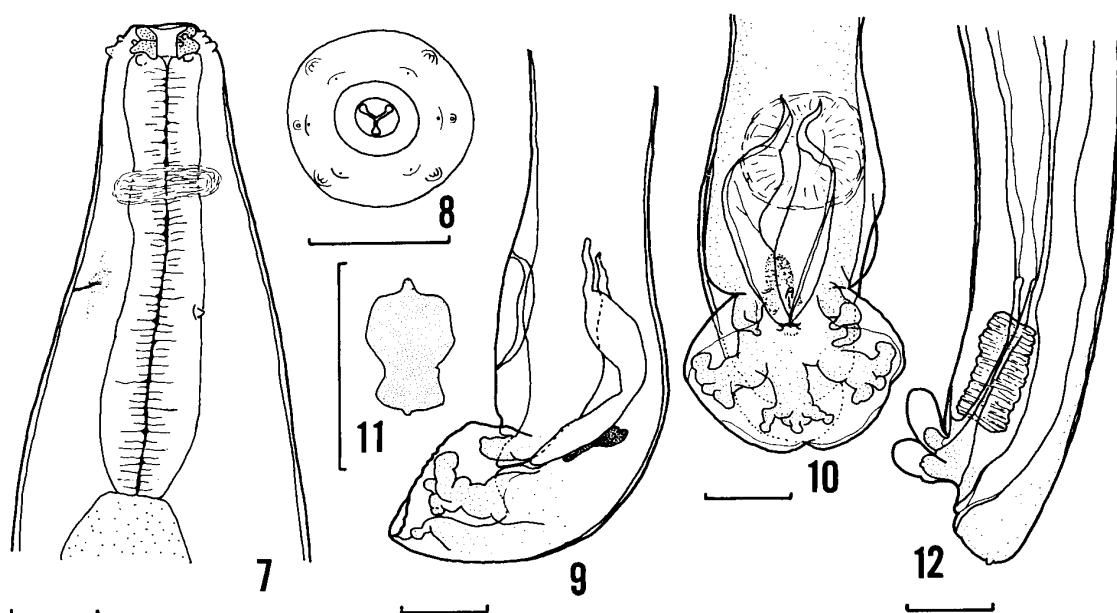
(Figs. 7-12)

*Host.* *Phocoenoides dalli* (Prevalence 33 of 50).

*Site.* Cranial sinuses.

*Locality.* The northern North Pacific, Bering Sea and adjoining seas of northern Japan (type locality).

*Specimen No.* NSMT-As 1638.

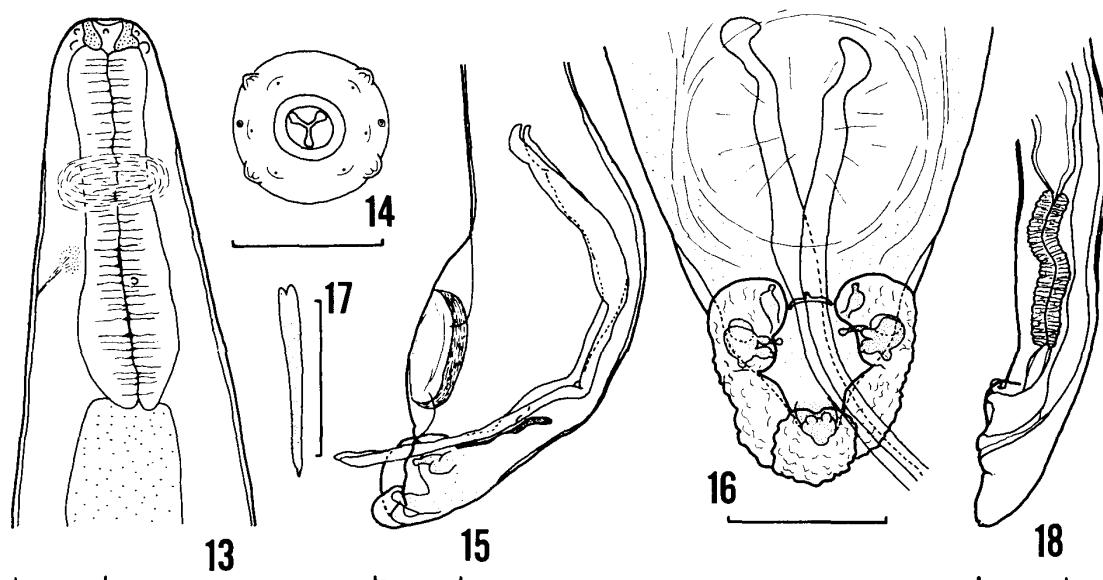


Figs. 7-12. *Stenurus yamagutii* sp. n.—7. Anterior end, lateral view. 8. Head, apical view. 9. Posterior end of male, lateral view. 10. Same, ventral view. 11. Gubernaculum, ventral view. 12. Posterior end of female, lateral view. (Scales: 0.1 mm.)

*Description. General:* Same as *Stenurus truei*.

*Male:* Based on 20 specimens. Body 10.8–13.6 mm in length and 0.35–0.44 mm in maximum width. Buccal capsule 20–28  $\mu\text{m}$  in inside diameter and 20–28  $\mu\text{m}$  in depth. Esophagus 0.44–0.50 mm long. Nerve ring, cervical papillae and excretory pore 0.12–0.23 mm, 0.21–0.36 mm and 0.29–0.34 mm from head end, respectively. A sucker-like depression, 0.10–0.13 mm in diameter, lying in front of bursa. Bursa cuticular, not divided into lobes, 0.13–0.18 mm in diameter. Ventral ray bifurcating near the base, each branch has papillary termination. Lateral ray ending in three digitations. Dorsal ray with a pair of lateral branches near the tip. Spicules curved, similar, equal, 0.30–0.35 mm long; the proximal portion is slender, the middle portion is swollen 50–66  $\mu\text{m}$  wide, tapering toward distal end. Gubernaculum thin, broad, slightly constricted near the middle, 75–110  $\mu\text{m}$  long. A single median papilla situated a little anterior to anus. Tail 0.11–0.17 mm long.

*Female:* Based on 20 specimens. Body 13.9–15.9 mm in length and 0.43–0.53 mm in maximum width. Buccal capsule 20–33  $\mu\text{m}$  in inside diameter and 30–40  $\mu\text{m}$  in depth. Esophagus 0.48–0.58 mm long. Nerve ring, cervical papillae and excretory pore 0.18–0.22 mm, 0.25–0.38 mm and 0.28–0.38 mm from head end, respectively. Uteri parallel to each other. Fully mature eggs 57–70  $\times$  39–47  $\mu\text{m}$ . Uterine larvae 200–240  $\times$  11–13  $\mu\text{m}$ . Uterine trunk and vagina 0.37–0.48 mm long and 0.18–0.23 mm long, respectively. Vaginal sphincter 110–160  $\times$  50–85  $\mu\text{m}$ , covered full length of vagina except for both ends. Vulva situated 60–90  $\mu\text{m}$  in front of anus, provided with two large, conspicuous bosses just before and behind the vulva, each



Figs. 13–18. *Pharurus dalli* (YAMAGUTI, 1951).—13. Anterior end, lateral view. 14. Head, apical view. 15. Posterior end of male, lateral view. 16. Same, ventral view. 17. Gubernaculum, ventral view. 18. Posterior end of female, lateral view. (Scales: 0.1 mm.)

contains a rounded pulp. Tail rounded, 15–64  $\mu\text{m}$  long, with a pair of small papillae near the tip.

*Discussion.* The genus *Stenurus* contains five species: *S. minor* (KUHN, 1829), *S. ovatus* (LINSTOW, 1910), *S. globicephala* BAYLIS et DOUBNEY, 1925, *S. arctomarinus* DELYAMURE et KLEINENBERG, 1958 and *S. truei* MACHIDA, 1974. Of them, the present new species is similar to *S. minor*, *S. ovatus* and *S. truei* in having short body length. In the male, however, it differs from the three species in having a bifurcated ventral ray, and from the latter two in having a lateral ray without an inner projection. In the female, it is different from the three species in having two large, conspicuous bosses just before and behind the vulva.

### *Pharurus dalli* (YAMAGUTI, 1951)

(Figs. 13–18)

*Host.* *Phocoenoides dalli* (Prevalence 50 of 50).

*Site.* Cranial sinuses.

*Locality.* The northern North Pacific, Bering Sea and adjoining seas of northern Japan.

*Specimen No.* NSMT-As 1639.

*Description.* General: Same as *Stenurus truei*.

Male: Based on 30 specimens. Body 8.7–11.0 mm in length and 0.28–0.42 mm in maximum width. Buccal capsule 20–31  $\mu\text{m}$  in inside diameter and 20–29  $\mu\text{m}$  in depth. Esophagus 0.34–0.42 mm long. Nerve ring, cervical papillae and ex-

cretory pore 0.12–0.21 mm, 0.21–0.30 mm and 0.24–0.30 mm from head end, respectively. A sucker-like depression 0.12–0.16 mm in diameter, lying in front of bursa. This region expanding dorsally. Bursa cuticular, 80–140  $\mu\text{m}$  in diameter, with margin curved inwards, divided into three lobes; a pair of lateral lobes and a dorsal lobe. Lateral lobe supported by a pair of ventral rays and a pair of lateral rays. Ventral ray short and slender, with papillary termination. Lateral ray ending in three digitations. A short, inward-directed projection arising from the base of lateral ray. Dorsal lobe supported by a dorsal ray which bifurcates on the tip. Spicules curved, similar, equal, 0.56–0.70 mm long with maximum width of 34–50  $\mu\text{m}$  in proximal portion, becoming slender toward distal end. Gubernaculum flat, slender, 78–160  $\mu\text{m}$  long. An inconspicuous median papilla lying on anterior lip of anus. Tail 0.07–0.10 mm long.

**Female:** Based on 30 specimens. Body 9.2–11.7 mm in length and 0.35–0.44 mm in maximum width. Buccal capsule 23–31  $\mu\text{m}$  in inside diameter and 23–35  $\mu\text{m}$  in depth. Esophagus 0.37–0.43 mm long. Nerve ring, cervical papillae and excretory pore 0.15–0.22 mm, 0.22–0.35 mm and 0.28–0.29 mm from head end, respectively. Uteri parallel to each other. Fully mature eggs 65–73  $\times$  40–47  $\mu\text{m}$ . Uterine larvae 110–170  $\times$  12–13  $\mu\text{m}$ . Uterine trunk and vagina 0.30–0.43 mm long and 0.29–0.42 mm long, respectively. Vaginal sphincter 160–220  $\times$  34–48  $\mu\text{m}$ , covered full length of vagina except for distal end. Vulva situated 55–110  $\mu\text{m}$  in front of anus, provided with two small cuticular bosses just before and behind the vulva. Tail conical, 52–85  $\mu\text{m}$  long, with a pair of small papillae near the tip.

**Discussion.** YAMAGUTI (1951) originally described this species under the name of *Irukanema dalli*, and later (1961) he regarded the genera *Irukanema* and *Torynurus* as synonyms of *Pharurus*, and transferred this species to the genus *Pharurus*. ARNOLD and GASKIN (1975) considered *Pharurus* and *Torynurus* to be two distinct genera, and made the distinction between the two as follows: the *Pharurus*, bursa has a dorsal lobe and two lateral lobes, ventral rays have bifid tips, and muscle pad is absent; the *Torynurus*, bursa lacks a dorsal lobe, its ventral rays are not bifid, the cuticle anterior to the bursa is a distinct alae forming a disk-like depression, and prebursal muscles inserted on median ventral surface of the body are muscle pad. ARNOLD and GASKIN placed *I. dalli* in the genus *Torynurus*. DELYAMURE (1976), unaware of the work of ARNOLD and GASKIN, equated the genera *Irukanema* and *Pharurus* with *Torynurus*, and included *I. dalli* in the genus *Torynurus*. We do not consider the genus *Irukanema* to be valid. Whether the ventral rays have bifid tips or not may be not a characteristic belonging to the genus. Sucker-like depression and muscle pad vary considerably among species. We consider the presence of the dorsal lobe to be a most important characteristic distinguishing *Pharurus* from *Torynurus*. YAMAGUTI (1951) did not describe distinctly the dorsal lobe in *I. dalli*, but he showed it clearly in the figure (pl. III, fig. 1). Since our specimen has a dorsal lobe in the bursa, it is also thought to belong to the genus *Pharurus*.

The females that YAMAGUTI (1951) initially described are 10 to 17 mm in body

length. As the measurement range is too large for *P. dalli*, two different species, *P. dalli* and *Stenurus yamagutii* might have been included. Further, YAMAGUTI took the morphological features of *S. yamagutii* for those of *P. dalli* in the structure of the female tail, vagina, etc. His specimen (pl. I, fig. 9) is undoubtedly that of *S. yamagutii*, owing to the round tail and the large cuticular bosses just before and behind the vulva. The correct description of the female is as detailed above.

The type specimens of *P. dalli* have been lost from YAMAGUTI's Collection in the Meguro Parasitological Museum, Tokyo. Our specimens were obtained from the same host and locality as were YAMAGUTI's, so we designate here our specimens (NSMT-As 1639) as neotypes of *P. dalli*.

### References

- ARNOLD, P. W., & D. E. GASKIN, 1975. Lungworms (Metastrongyloidea: Pseudaliidae) of harbor porpoise *Phocoena phocoena* (L. 1758). *Can. J. Zool.*, **6**: 713-735.
- BAYLIS, M. A., & R. DAUBNEY, 1925. A revision of the lung-worms of Cetacea. *Parasitology*, **17**: 201-216.
- DAILEY, M. D., 1971. Distribution of helminths in the Dall's porpoise (*Phocoenoides dalli* TRUE). *J. Parasit.*, **57**: 1348.
- & W. WALKER, 1978. Parasitism as a factor (?) in single strandings of southern California cetaceans. *Ibid.*, **64**: 593-596.
- DELYAMURE, S. L., 1976. Fundamentals of Nematology. Vol. 26. Metastrongyloids of domestic and wild animals. Family Pseudaliidae RAILLIET, 1966. (English ed., 1985. New Delhi, Oxonian Press, 157-243.)
- KASUYA, T., 1978. The life history of Dall's porpoise with special reference to the stock off Pacific coast of Japan. *Sci. Rep. Whales Res. Inst.*, **30**: 1-63.
- MACHIDA, M., 1974. Helminth parasites of the True's porpoise, *Phocoenoides truei* ANDREWS. *Bull. natn. Sci. Mus., Tokyo*, **17**: 221-226, pl. 1.
- NISHIWAKI, M., 1967. Distribution and migration of marine mammals in the North Pacific area. *Bull. Ocean. Res. Inst. Univ. Tokyo*, **1**: 1-64.
- YAMAGUTI, S., 1951. Studies on the helminth fauna of Japan. Part 46. Nematodes of marine mammals. *Arb. Med. Fak. Okayama*, **7**: 295-306, pls. 1-3.
- 1961. Systema Helminthum. Vol. 3. The nematodes of vertebrates. Pp. 1-917, pls. 1-102. New York, Interscience Publ.